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E70 Anti-theft Alarm System (DWA)

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Anti-theft Alarm System

Model: E70

Production: From Start of Production

OBJECTIVES

After completion of this module you will be able to:

- Describe the operation of the Anti-theft Alarm System on the E70.
- Identify the different functions related to the Anti-theft Alarm System on the E70.
- Identify the individual components that operate the Alarm System.
- Diagnose and repair the Anti-theft Alarm System on the E70.

Introduction

Anti-theft Alarm System

The anti-theft alarm system (DWA) is available as standard equipment. The task of the anti-theft alarm system is to indicate unauthorized access to the vehicle by emitting an alarm. The alarm can be triggered both audibly and visually. To do this, however, the alarm system must be armed. When activated, the alarm monitors the entire vehicle interior.

In addition, the alarm system monitors the engine compartment and the vehicle's rest position. In order that nothing can be stolen from the luggage compartment, the alarm system monitors the tailgate.

The alarm also indicates if the vehicle has been tampered with like cutting the feed line to the emergency siren.

The anti-theft alarm system is based on the E90. However, the alarm system's ultrasonic passenger-compartment sensor is located fully in the roof function center.

The ultrasonic signal passes into the inside of vehicle through openings in the grill of the roof function center. The emergency power siren with tilt alarm sensor is located near the front wheel arch.

Alarm System Diagram Legend

Index	Explanation	Index	Explanation
1	Emergency power siren with integrated tilt alarm sensor SINE	11	Door contact, rear driver's side
2	Bonnet contact	12	Door contact, driver's door
3	Junction box control unit JB	13	Footwell module FRM
4	Door contact, passenger's door	14	Anti-theft alarm system DWALED
5	Door contact, rear passenger's side	15	Roof function center FZD with ultrasonic passenger compartment sensor USIS
6	Tailgate soft-close automatic relay	16	Car Access System 3 CAS3
7	Tailgate soft-close automatic drive	DWA-Bus	DWA bus (K bus protocol)
8	Outer rear hatch button	K-CAN	CAN body
9	Tailgate central locking system	KL30	Terminal 30
10	Trunk lid contact		

Door contacts (4, 5, 11, 12 Hall sensors) are monitored by the footwell module (13). As soon as the status of a Hall sensor changes, the ultrasonic passenger-compartment sensor (15) receives this change via the K-CAN. If the anti-theft alarm system is armed, an alarm is triggered.

The engine-bonnet contact (2) is monitored by the Car Access System 3 (16). If the status changes, an alarm is also triggered.

Opening the tailgate is monitored by the junction box control unit (3). If the status of the boot-lid contact (10) changes, this also triggers an alarm.

Functions

Overview

When armed, the anti-theft alarm system in the E70 monitors the whole vehicle. The doors, hood and trunk lid, emergency current siren, the vehicle interior and the DWA bus are mainly monitored.

Note: The anti-theft alarm system can be armed or disarmed at terminal 30. It is not possible to arm the anti-theft alarm system at terminal R or terminal 15.

Arming the Anti-theft Alarm System

The anti-theft alarm system is armed when the vehicle is centrally locked. Arming can be triggered by the following components:

- Driver's door lock Cylinder
- Remote control/ID transmitter (only with Comfort Access)
- Outside door handle with Comfort Access (sensitive surface)

After the vehicle has been centrally locked, the emergency power siren is first armed together with the tilt alarm sensor. All door contacts, the hood contact and the trunk-lid contact are then set for plausibility detection. Once the contacts are set, they are then linked to the vehicle monitoring system by the anti-theft alarm system.

The tilt alarm sensor and the ultrasonic passenger-compartment sensor must be adjusted to the vehicle each time that the vehicle is centrally locked. This is called initializing. The tilt alarm sensor delivers information on the vehicle's rest position. If this value is plausible, the tilt alarm sensor is included in the vehicle monitoring process.

The anti-theft alarm system's ultrasonic passenger-compartment sensor captures information on the interior of the passenger compartment. It therefore takes a little time before the ultrasonic passenger-compartment sensor can actively be used for the anti-theft alarm system. The ultrasonic passenger compartment sensor is switched to 'armed' about 20s after the contacts have been linked to the alarm system.

Deactivating Tilt Alarm Sensor and Ultrasonic Passenger Compartment Protection System (interior movement detector)

It is advisable to deactivate the tilt alarm sensor and ultrasonic passenger compartment protection system in the following situations:

- Vehicle in tilt-type duplex garage
- Vehicle on ship transport
- Vehicle on car transporter
- People or animals in vehicle

Deactivation takes place after central locking or comfort closing by locking the vehicle again within 10s. To acknowledge, the alarm system LED is lit for 2 seconds.

Note: The tilt alarm sensor or ultrasonic passenger-compartment sensor can be permanently deactivated by way of coding.

Disarming the Anti-theft Alarm System

The anti-theft alarm system is disarmed by the "unlock" or "selective unlock" central locking functions. An audible and/or visual signal can be output in connection with disarming corresponding to the country-specific version.

If an alarm was triggered during the time when the anti-theft alarm system was armed, the alarm system LED flashes for 5 minutes. If the system is disarmed during the alarm, the action is not acknowledged but rather the alarm is terminated.

Unlocking the Luggage Compartment

The tilt alarm sensor and ultrasonic passenger-compartment protection system are blanked out if the luggage compartment is unlocked and opened on an armed vehicle. New vehicle rest positions could occur as a result of loading the vehicle. Initialization for the ultrasonic passenger-compartment protection system and the tilt alarm sensor restarts 3 seconds after closing the tailgate.

Forced Disarming

The anti-theft alarm system is armed when a person remains in the vehicle and sets the vehicle central arrest function via the remote control. If the remote control is inserted into its slot, the Car Access System 3 recognizes this and forwards information to the anti-theft alarm system. The anti-theft alarm system is compulsorily disarmed.

Note: The Car Access System 3 sends a "locked" message via the K-CAN and the anti-theft alarm system is compulsorily disarmed.

No Crosswise Operation

If crosswise operation is not implemented, an alarm is triggered when the anti-theft alarm system is disarmed.

This applies to arming with the remote control and disarming via the lock barrel in the driver's door. The footwell module detects that the driver's door has been unlocked with the lock cylinder and makes this information available via the K-CAN.

The Car Access System 3 detects the unlock status by the driver's door lock cylinder, however, it does not unlock the vehicle. The anti-theft alarm system remains armed and triggers the alarm when the driver's door is opened.

This function is coded in the Car Access System 3.

Feedback from Anti-theft Alarm System

When arming, the anti-theft alarm system provides feedback only when all doors, the hood and the trunk lid have been closed. This acknowledgement can be visual or audible. For example, the anti-theft alarm system LEDs or the hazard warning lights are activated by way of visual acknowledgement. The emergency power siren is activated by way of audible acknowledgement.

Feedback via DWA LED

The DWA LED serves as an indicator showing the status of the anti-theft alarm system. The roof functions center supplies the DWA LED with signals from the ultrasonic passenger compartment sensor.

DWA status	DWA LED
Disarmed	OFF
Activated	ON
Armed but not all contacts closed	Blinks for 10 s then continues flashing
Ultrasonic passenger-compartment/tilt alarm sensor OFF	Lights up for 2 s and then remains on
Alarm triggered	Flashes rapidly for 5 minutes and then remains on
Disarming	Goes off
Disarming after alarm	Blinks for 5 minutes or is interrupted when "remote control inserted"

Note: When blinking, the DWA LED is driven at a frequency of 0.5 Hz. The switch-on time is 60 ms. When the DWA LED flashes, it is activated at a frequency of 2 Hz.

Feedback Via Blinking Lights

Visual feedback in response to arming and disarming via the blinking lights serves as an indicator for the vehicle user. The feedback is coded specifically to the country and/or vehicle.

DWA status	Signal of hazard warning lights
Arming	Hazard warning lights flash once
Disarming	Hazard warning lights flash twice
Arming with doors open or trunk lid open	The hazard warning lights do not flash until the last door or trunk lid has been locked
Disarming after alarm	Hazard warning lights flash four times at double frequency

Feedback Via Emergency Current Siren

Audible feedback during the arming and disarming procedure for the vehicle user is coded country-specific.

DWA status	Signal of emergency current siren
Arming	Signal tone sound once
Disarming	Signal tone sounds twice
Arming with doors open or trunk lid open	No signal tone, sounds only after closing the last door or trunk lid

Comfort Access

It is possible to place the ID transmitter in the luggage compartment when the vehicle is locked and the luggage compartment open. On closing the luggage compartment, the trunk lid is automatically opened again in order to avoid locking the ID transmitter in the luggage compartment. In addition to automatically opening the trunk lid, the anti-theft alarm system outputs an audible warning. The warning comprises a triple double-tone of the emergency current siren.

Alarm Trigger

The anti-theft alarm system can be triggered by the following components:

- Door contacts
- Trunk lid contact
- Bonnet contact
- Ultrasonic passenger-compartment protection
- Emergency power siren with integrated tilt alarm sensor

Door Contacts

The status of the door contacts is evaluated by the footwell module and signalled to the ultrasonic passenger-compartment protection system. The status of the individual door contacts is included in the vehicle monitoring system 6 s after the status signal "door closed" is issued. This means that an alarm can be triggered via a door that is already closed even if another door contact is still open.

Trunk Lid Contact

The status of the boot lid contact is evaluated by the junction box control unit and signalled to the ultrasonic passenger-compartment protection system. When the tailgate is closed, the junction box control unit receives a low signal (about 0 V). Initially, signals from the boot lid contact, ultrasonic passenger compartment sensor and tilt alarm sensor are hidden out when the boot lid is unlocked and the anti-theft alarm system is armed. The signals are also blanked out when the boot lid is unlocked with the remote control with the anti-theft alarm system armed. The boot lid contact is readopted into the vehicle monitoring system 6 s after closing the tail gate. The initialization procedure for the ultrasonic passenger-compartment sensor and tilt alarm sensor is started if another door or the boot lid is no longer open.

Because of the manipulation prevention system, unlocking the luggage compartment with the aid of the mechanical key when the DWA is armed will cause an alarm to be triggered.

Hood

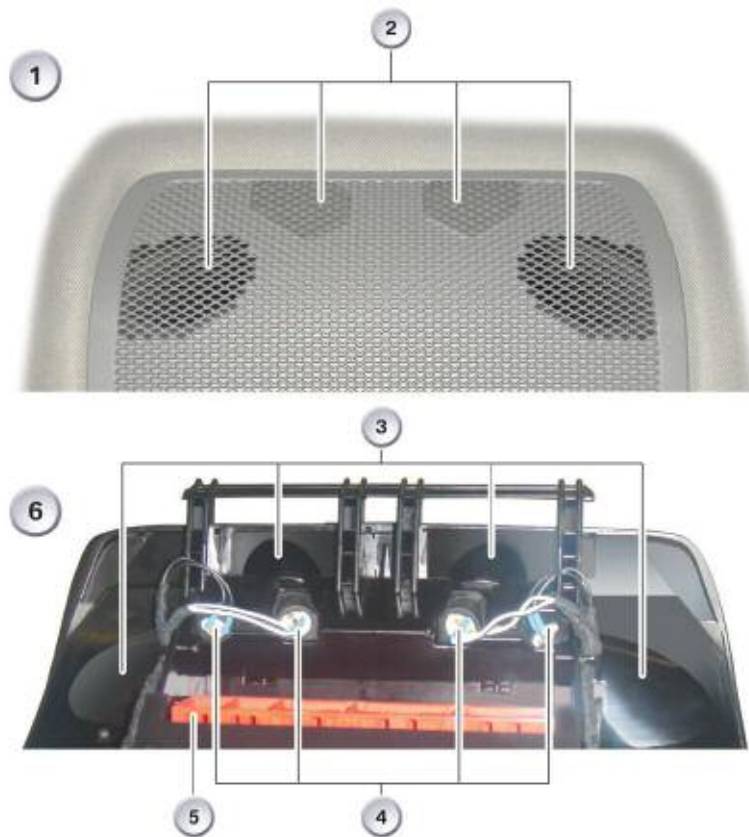
The status of the engine-bonnet contact is evaluated by the Car Access System 3 and signalled to the ultrasonic passenger compartment protection system. The status of the engine-bonnet contact is included in the vehicle monitoring system table 6 s after the status signal "bonnet closed" is issued. If not connected, the Car Access System 3 interprets the bonnet contact as closed. When the engine bonnet is closed, the Car Access System 3 receives a low signal (about 0 V).

Ultrasonic Passenger Compartment Protection

The ultrasonic passenger-compartment sensor captures and evaluates movements in the vehicle interior. Initialization of the ultrasonic passenger-compartment sensor is started 3 s after closing the engine bonnet, tailgate and the last door.

The ultrasonic passenger-compartment sensor is operational 20 s after the start of initialization and is included in the vehicle monitoring system. The ultrasonic passenger compartment sensor has been integrated into the roof function center. The roof function center is connected to the K-CAN and DWA bus.

Ultrasonic Passenger Compartment Protection



Index	Explanation	Index	Explanation
1	Front of roof function center	4	Ultrasonic sensor
2	Exit openings of ultrasonic sensors	5	Roof function center connector
3	Funnel for ultrasonic sensors	6	Rear of roof function center

Tilt Alarm Sensor

The tilt alarm sensor registers the vehicle rest position when it is armed and detects changes in the position, like jacking up the vehicle. The tilt alarm sensor is integrated in the emergency current siren.

Initialization of the tilt alarm sensor is started 3 s after closing all doors and flaps. The tilt alarm sensor is operational 30 s after initialization and is included in the vehicle monitoring system. If the tilt alarm sensor detects vehicle movement, a corresponding signal is sent to the ultrasonic passenger-compartment protection system. The anti-theft alarm system decides whether the movement is sufficient to trigger an alarm.

To ensure a false alarm is not triggered as the result of the vehicle rocking, the angle values for the longitudinal and transverse axis are determined every 90 ms. An alarm is triggered only if the vehicle remains in an inclined position for longer than about 1.5 s.

Self-monitoring of Emergency Current Siren

A self-monitoring facility that is activated immediately after the anti-theft alarm system has been armed is implemented in the emergency current siren. The emergency current siren monitors its own power supply and detects overvoltage, low voltage and line break (open-circuit).

If anyone attempts to manually interfere with the emergency power siren or its supply leads, the emergency power siren will trigger an alarm. At the same time, it reports this alarm to the ultrasonic passenger-compartment sensor regardless of whether the DWA bus has been affected.

Line Monitoring - DWA Bus

The ultrasonic passenger-compartment protection system and the emergency current siren are connected via the DWA bus. Immediately after arming the anti-theft alarm system, the DWA bus is monitored cyclically every 1.5 seconds.

The anti-theft alarm system sends a line monitoring request on the DWA bus to the emergency current siren. The emergency power siren must respond within 100 ms. If no response is received, the anti-theft alarm system triggers an alarm. The line monitoring facility is also active while the alarm is triggered.

The anti-theft alarm system in the roof function center measures the system voltage. The line monitoring facility is switched off at a system voltage below 9 V. This avoids false alarms.

Alarm Output

If an alarm criterion is fulfilled with the anti-theft alarm system armed, the alarm is output (triggered) audibly and/or visually corresponding to the country-specific coding.

Audible Alarm

The emergency power siren receives a signal via the DWA bus when the ultrasonic passenger-compartment sensor triggers an alarm. It is installed in the front left wheel arch. The emergency current siren confirms receipt of the alarm request and triggers the audible alarm.

If the alarm request is not confirmed, the anti-theft alarm system will repeat the alarm request up to eight times.

Depending on the country-specific coding of the emergency current siren, an intermittent or interval tone is generated. The audible alarm is interrupted immediately and without feedback when the anti-theft alarm system is disarmed.



Visual Alarm

Depending on the country-specific version, the following components of the outer lighting system can be activated for the visual alarm:

- Direction indicator lights
- Low beam headlight
- High beam headlight.

When the anti-theft alarm system triggers an audible alarm, a visual alarm is simultaneously triggered for 5 minutes. The anti-theft alarm system sends the "flash" request via the K-CAN to the footwell module. In turn, the footwell module activates the components of the exterior lighting system.

The visual alarm cannot be extended by repeated alarm triggering. The visible alarm is terminated immediately and without feedback when the anti-theft alarm system is disarmed.

Autarkic Alarm

The emergency current cycle triggers the autarkic alarm if its lines are tampered with. If the DWA bus is also cut through, the ultrasonic passenger-compartment sensor detects this situation by the absence of the reply from the emergency current siren. In turn, the ultrasonic passenger-compartment protection system triggers the visual alarm.

Panic Mode

Panic mode is an opportunity to attract attention by triggering an alarm, e.g. when under threat from the outside or in the event of an accident.

Panic mode is initiated by pressing the boot lid button on the remote control/ID transmitter. The button must be pressed for longer than 2.5 s irrespective of whether the anti-theft alarm system is armed or not.

The alarm is terminated by pressing any button on the remote control/ID transmitter. Panic mode is not stored. On completion of panic mode, the anti-theft alarm system assumes the setting that was selected prior to panic mode.

Alarm Termination

An alarm triggered for test purposes or inadvertently can be terminated by disarming the anti-theft alarm system or by inserting the remote control/ID transmitter into its holder. The alarm is terminated immediately. No audible or visual feedback is output.

Note : Panic mode is at present only coded in US vehicles.

Procedure	Explanation
Feedback	Activate/deactivate feedback tone.
Alarm tone	Modulated tone
Audible alarm duration (independent alarm)	30 seconds
Visual alarm	Hazard warning lights: All country-specific versions High beam headlight
Personalization packages taking into account the respective countries	Anti-theft alarm system feedback, visual and audible tilt alarm sensor active/not active No anti-theft alarm function in distribution mode Partly disarmed anti-theft alarm function in hotel setting
Others	Extension of referencing time, tilt alarm sensor Termination of line monitoring at 9 V

Diagnosis

All information is stored in the non-volatile alarm memory.

Alarm Memory, Ultrasonic Passenger Compartment Protection

The alarm memory of the ultrasonic passenger compartment protection system stores all alarms apart from the autarkic alarm. The alarm memory contains the following information:

- Cause of alarm trigger
- Subsequent alarm triggers
- Date
- Time
- Ambient conditions
 - Outside temperature
 - Window position
 - Sunroof position
 - Heating

An alarm history is formed from the beginning to the end of the alarm. The manner in which the alarm is ended is also defined. The alarm can be terminated by disarming it or by allowing it to run its course. The last 10 alarms are stored in the alarm memory.

Alarm Memory, Emergency Current Siren

The alarm memory in the emergency current siren stores only the data of the autarkic alarms. The last five autarkic alarms are stored.

Note: Autarkic alarm is a function of the siren that protects it against being tampered with. Once the siren receives the "arm" signal from the DWA module (FZD), it then will constantly monitor the DWA-Bus, Power, and Ground. If one of these is tampered with, such as disconnection, the siren automatically activates. This activation is not stored in the alarm memory when connected to the DISplus or GT1. It is completely independent of the DWA module. This is why it is called autarkic. It means independent or stand alone.